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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,844	04/06/2006	Ryoji Funahashi	062327	5027

38834 7590 09/04/2008
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
1250 CONNECTICUT AVENUE, NW
SUITE 700
WASHINGTON, DC 20036

EXAMINER	
SALZMAN, KOURTNEY R	
ART UNIT	**PAPER NUMBER**
1795	
MAIL DATE	**DELIVERY MODE**
09/04/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/574,844	FUNAHASHI, RYOJI	
	Examiner	Art Unit	
	KOURTNEY R. SALZMAN	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _20 May 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-18_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-18_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _March 14, 2008 and April 16, 2008_.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed May 20, 2008 has been entered and fully considered.

2. Claims 1-18 remain pending in the application.

3. The 35 USC 103 rejections are withdrawn in light of the applicant's amendments.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by MATSUBARA et al (Matsubara, Ichiro, Ryoji Funahashi, Tomonari Takeuchi, Satoshi Sodeoka, Tadaaki Shimizu, and Kazuo Ueno. "Fabrication of an all-oxide thermoelectric power generator." Applied Physics Letters 78 (2001): 3627-629.).

MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the material in formula a in the instant application claim 1. If subscript b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application. MATSUBARA et al teaches the addition of a metal to form a paste (left column of page 3628 or figure 1). At the interface of the Pt material, or metal material, and the p-leg made of the oxide listed above,

there is a layer which has the mixed composition required by the instant application.

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over ALEXANDER (US 5,422,190) combined with MATSUBARA et al (Matsubara, Ichiro, Ryoji Funahashi, Tomonari Takeuchi, Satoshi Sodeoka, Tadaaki Shimizu, and Kazuo Ueno. "Fabrication of an all-oxide thermoelectric power generator." Applied Physics Letters 78 (2001): 3627-629.).

Regarding claim 1, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract $Ca_3Co_4O_9$. This corresponds to the material in formula a in the instant application claim 1. If subscript b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

Alternatively, regarding claim 1, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract $Ca_3Co_4O_9$. This corresponds to the material in formula a in the instant application claim 1. If subscript b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

MATUBARA et al teaches the addition of a metal to form a paste (left column of page 3628 or figure 1), but fails to teach the use of the powdery oxide in the thermoelectric paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide

simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the oxide thermoelectric material of MATSUBARA et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide because as shown in figure 1 of MATSUBARA et al, the oxide material (comprising the p-leg) conducts electricity from one fin to the other, making it an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of MATSUBARA et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

Regarding claim 2, in conjunction with the rejection of claim 1 shown above, the amount of refractory oxide present relative to the amount of metallic powder is best shown in the example contained in TABLE 1 of ALEXANDER. If the ratio of parts of oxide per 100 parts of metallic particles is calculated, this example shows approximately 6.57 parts of the refractory oxide are present per 100 parts of metallic oxide. This value is included in the range of the instant application. In the alternative, the amount of metal added to the conductive paste effects the conductivity through electrical components or

between the semiconductors. When more metallic material is used in the paste, the easier it becomes for the paste to conduct the electricity through the thermoelectric device. The optimization of the amounts of oxide relative to the amount of metallic material would be determinable through routine experimentation.

Regarding claim 3, in conjunction with the rejection of claim 1 shown above, both a vehicle, or resin of the instant application, and glass binder are used to create a silver paste, as detailed in table II, for example, in column 5, of ALEXANDER. A vehicle is said to be used to produce the paste and is “typically a resin dissolved in a solvent” (column 3, lines 61-63).

Regarding claim 4, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the material in formula a in the instant application claim 1. If subscript b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

Alternatively, regarding claim 4, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the material in formula a in the instant application claim 1. If subscript b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

MATUBARA et al teaches the addition of a metal to form a paste (left column of page 3628 or figure 1), but fails to teach the use of the powdery oxide in the thermoelectric paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the

conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the oxide thermoelectric material of MATSUBARA et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide because as shown in figure 1 of MATSUBARA et al, the oxide material (comprising the p-leg) conducts electricity from one fin to the other, making it an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of MATSUBARA et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

Regarding claim 5, in conjunction with the previous rejection of claim 4, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the material in the first formula listed in the instant application claim 5. If subscript b of the instant application was found to be zero, the material of MATSUBARA et al matches that required in the instant application.

Regarding claim 6, in conjunction with the rejection of claim 4 shown above, the amount of refractory oxide present relative to the amount of metallic powder is best shown in the example contained in TABLE 1 of ALEXANDER. If the ratio of parts of oxide per 100 parts of metallic particles is calculated, this example shows approximately 6.57 parts of the refractory oxide are present per 100 parts of metallic oxide. This value is included in the range of the instant application. In the alternative, the amount of metal added to the conductive paste effects the conductivity through electrical components or between the semiconductors. When more metallic material is used in the paste, the easier it becomes for the paste to conduct the electricity through the thermoelectric device. The optimization of the amounts of oxide relative to the amount of metallic material would be determinable through routine experimentation.

Regarding claim 7, in conjunction with the rejection of claim 4 shown above, both a vehicle, or resin of the instant application, and glass binder are used to create a silver paste, as detailed in table II, for example, in column 5, of ALEXANDER. A vehicle is said to be used to produce the paste and is “typically a resin dissolved in a solvent” (column 3, lines 61-63).

8. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over ALEXANDER (US 5,422,190) combined with FUNAHASHI et al (JP Abstract Publication number 2003-282964).

Regarding claim 8, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application under indentation (i). The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero

subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

Alternatively, regarding claim 8, FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application under indentation (i). The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

While FUNAHASHI et al teaches the oxide to have conductive properties (obvious in a semiconductor material), FUNAHASHI et al fails to teach the use of the oxide in a conductive paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide

simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the thermoelectric oxide of FUNAHASHI et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide obviously conducts electricity through devices, making it an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of FUNAHASHI et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

Regarding claim 9, in conjunction with the previous rejection of claim 8, FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application under indentation (i). The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

Regarding claim 10, in conjunction with the rejection of claim 8 shown above, the amount of refractory oxide present relative to the amount of metallic powder is best shown in the example contained in TABLE 1 of ALEXANDER. If the ratio of parts of oxide per 100 parts of metallic particles is calculated, this example shows approximately 6.57 parts of the refractory oxide are present per 100 parts of metallic oxide. This value is included in the range of the instant application. In the alternative, the amount of metal added to the conductive paste effects the conductivity through electrical components or between the semiconductors. When more metallic material is used in the paste, the easier it becomes for the paste to conduct the electricity through the thermoelectric device. The optimization of the amounts of oxide relative to the amount of metallic material would be determinable through routine experimentation.

Regarding claim 11, in conjunction with the rejection of claim 8 shown above, both a vehicle, or resin of the instant application, and glass binder are used to create a silver paste, as detailed in table II, for example, in column 5, of ALEXANDER. A vehicle is said to be used to produce the paste and is "typically a resin dissolved in a solvent" (column 3, lines 61-63).

9. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over ALEXANDER (US 5,422,190) combined with MATSUBARA et al (Matsubara, Ichiro, Ryoji

Funahashi, Tomonari Takeuchi, Satoshi Sodeoka, Tadaaki Shimizu, and Kazuo Ueno. "Fabrication of an all-oxide thermoelectric power generator." Applied Physics Letters 78 (2001): 3627-629.) and FUNAHASHI et al (JP Abstract Publication number 2003-282964).

Regarding claim 12, MATSUBARA et al teaches a p type material, as stated in the abstract, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula in the instant application claim 12. If subscripts b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

FUNAHASHI et al teaches an n-type thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed as an n-type thermoelectric material in claim 12. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

The paste to combine the n-type and p-type material is disclosed in the rejection of claim 1 shown above. At the time of the invention, it would have

been obvious to one of ordinary skill in the art to utilize a paste with oxide and metal constituents as shown in figure 1 of MATSUBARA et al to connect the p-type material of MATSUBARA et al and n-type material of FUNAHASHI et al because this is shown in figure 1.

Regarding claim 13, MATSUBARA et al teaches a p type material, as stated in the abstract, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula in the instant application claim 12. If subscripts b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

FUNAHASHI et al teaches an n-type thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed as an n-type thermoelectric material in claim 12. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

Regarding the p-type paste of claim 13, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of "gold, silver and palladium and a refractory oxide", where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula listed in the instant application claim 13. If subscript b and d of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

Alternatively, regarding the p-type paste of claim 13, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula listed in the instant application claim 13. If subscript b and d

of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

MATUBARA et al teaches the addition of a metal to form a paste (left column of page 3628 or figure 1), but fails to teach the use of the powdery oxide in the thermoelectric paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the oxide thermoelectric material of MATSUBARA et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide because as shown in figure 1 of MATSUBARA et al, the oxide material (comprising the p-leg) conducts electricity from one fin to the other, making it

an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of MATSUBARA et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

Regarding the n-type conductive paste of claim 13, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of "gold, silver and palladium and a refractory oxide", where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application under indentation (i) of the n-type paste section of claim 13. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element

where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

Alternatively, regarding the n-type paste of claim 13, FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application under indentation (i) of the n-type paste section of claim 13. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

While FUNAHASHI et al teaches the oxide to have conductive properties (obvious in a semiconductor material), FUNAHASHI et al fails to teach the use of the oxide in a conductive paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the

conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the thermoelectric oxide of FUNAHASHI et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide obviously conducts electricity through devices, making it an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of FUNAHASHI et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to utilize a paste with oxide and metal constituents, as shown in figure 1 of MATSUBARA et al to connect the p-type material of MATSUBARA et al and n-type material of FUNAHASHI et al because the material at the interface of the p-type and n-type legs with the Platinum material, mixes the complex oxides of the p-type and n-type materials with the metal Pt conductor, as shown in figure 1.

Regarding claim 14, MATSUBARA et al teaches a p type material, as stated in the abstract, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula in the instant application claim 14. If subscript b of the instant application were found to be zero, the material of MATSUBARA et al matches that required in the instant application.

FUNAHASHI et al teaches an n-type thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed as an n-type thermoelectric material in claim 14. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

Regarding the p-type paste of claim 14, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the

fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula listed in the instant application claim 14. If subscript b of the instant application was found to be zero, the material of MATSUBARA et al matches that required in the instant application.

Alternatively, regarding the p-type paste of claim 14, MATSUBARA et al teaches a thermoelectric p-type oxide in the abstract Ca3Co4O9. This corresponds to the first formula listed in the instant application claim 14. If subscript b of the instant application was found to be zero, the material of MATSUBARA et al matches that required in the instant application.

MATUBARA et al teaches the addition of a metal to form a paste (left column of page 3628 or figure 1), but fails to teach the use of the powdery oxide in the thermoelectric paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the oxide thermoelectric material of MATSUBARA et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide because as shown in figure 1 of MATSUBARA et al, the oxide material (comprising the p-leg) conducts electricity from one fin to the other, making it an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of MATSUBARA et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

Regarding the n-type conductive paste of claim 14, ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides. Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

ALEXANDER fails to teach the composition of the refractory oxide.

FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application of the n-type paste section of claim 14. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

Alternatively, regarding the n-type paste of claim 14, FUNAHASHI et al teaches a thermoelectric material in the abstract, $La_{1-x}M_xNiO_{(2.7-3.3)}$. This material corresponds to the first oxide listed in the instant application of the n-type paste section of claim 14. The La of FUNAHASHI et al corresponds to the Ln or lanthanide series of the instant application. The M component of FUNAHASHI et al matches the R1 element where both can be Na, K, Ca or Bi. The R^2 component of the instant application needs to be set to the zero subscript. Also x for example could be anything between .5 and .99 to be applicable to instant application.

While FUNAHASHI et al teaches the oxide to have conductive properties (obvious in a semiconductor material), FUNAHASHI et al fails to teach the use of the oxide in a conductive paste.

ALEXANDER teaches a via fill paste for use in electronics. The via fill paste is stated, in column 1, lines 27-30, "to provide an electrical bridge or connection between the conductive layers". In the instant application, the conductive layers are the n-type and p-type semiconductors to be connected via the conductive paste, or in ALEXANDER the fill paste. The fill paste is said to be made of “gold, silver and palladium and a refractory oxide”, where the oxide simply comprises one or more of a list of metals including the lanthanides.

Column 3, lines 25-42, repeatedly prescribe the use of metal powders in the paste.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the thermoelectric oxide of FUNAHASHI et al in the thermoelectric conductive paste of ALEXANDER requiring a conductive oxide obviously conducts electricity through devices, making it an obvious addition to a conductive paste. Also, it would have been obvious to one of ordinary skill in the art to add a metal, as disclosed in ALEXANDER, to the oxide of FUNAHASHI et al to create a conductive paste, as metal is obviously used when electrical conduction is a desirable characteristic.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to utilize a paste with oxide and metal constituents, as shown in figure 1 of MATSUBARA et al to connect the p-type material of MATSUBARA et al and n-type material of FUNAHASHI et al because the material at the interface of the p-type and n-type legs with the Platinum material, mixes the complex oxides of the p-type and n-type materials with the metal Pt conductor, as shown in figure 1.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to utilize a paste with oxide and metal constituents, as shown in

figure 1 of MATSUBARA et al to connect the p-type material of MATSUBARA et al and n-type material of FUNAHASHI et al because the material at the interface of the p-type and n-type legs with the Platinum material, mixes the complex oxides of the p-type and n-type materials with the metal Pt conductor, as shown in figure 1.

10. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over ALEXANDER (US 5,422,190) combined with MATSUBARA et al (Matsubara, Ichiro, Ryoji Funahashi, Tomonari Takeuchi, Satoshi Sodeoka, Tadaaki Shimizu, and Kazuo Ueno. "Fabrication of an all-oxide thermoelectric power generator." Applied Physics Letters 78 (2001): 3627-629.) and FUNAHASHI et al (JP Abstract Publication number 2003-282964) as applied to claim 12 above, and further in view of BUIST (US 4,859,250).

The combination of the materials disclosed in FUNAHASHI et al and MATSUBARA et al, connected with the paste disclosed in ALEXANDER, fails to disclose the location of the thermoelectric components in the thermoelectric device.

Regarding claim 15, in conjunction with the previous rejections of claims 1 and 12, BUIST teaches in figure 3A the location and connection of p-type and n-type semiconductors. The semiconductors are shown to be attached to a substrate, reference number 24, as described in the column 4 line 14- 45 description of the figure. The thermoelectric element includes the n-type conductor (reference number 64), p-type conductor (reference number 66) and

connection between the two (reference number 82). Each element is shown connected in series. The unconnected end of the p-type semiconductor is electrically connected to the unconnected end of the n-type semiconductor using lead, reference number 80. This is method of connection is conventional to one of ordinary skill in this art. Therefore, the connection of an n-type and p-type semiconductor via an unconnected end would be obvious.

Regarding claim 16, in conjunction with the previous rejections of claims 1, 12 and 15, BUIST utilizes the configuration of thermoelectric elements, as in the rejection of claim 15, shown in figure 3A, and forms the elements into strips affixed to the flexible plastic substrate. In column 5, lines 5-8, BUIST teaches, "the thermoelectric elements are folded to combine all cold strings on a first plane and all hot strips on a second plant opposing the first plane of cold strips". Shown in figure 4, the hot side is compiled on one end of the modulus, while the cold side s complied opposite.

At the time of invention, one of ordinary skill in the art would find it obvious to organize the combination of the materials disclosed in FUNAHASHI et al, MATSUBARA et al and ALEXANDER in the manner of BUIST because the layout of similar temperature elements on opposing sides is obvious. It is intuitive to place the cold strip elements on one side of the thermoelectric modulus and the hot elements on the other because a thermoelectric device is usually used

to generate power from a temperature gradient on two different sides of the device. The organization of the elements taught by FUNAHASHI et al, MATSUBARA et al and ALEXANDER in the pattern of BUIST is obvious as it allows the thermoelectric device to function efficiently.

11. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over ALEXANDER (US 5,422,190) combined with MATSUBARA et al (Matsubara, Ichiro, Ryoji Funahashi, Tomonari Takeuchi, Satoshi Sodeoka, Tadaaki Shimizu, and Kazuo Ueno. "Fabrication of an all-oxide thermoelectric power generator." Applied Physics Letters 78 (2001): 3627-629.) and FUNAHASHI et al as applied to claim 13 above, and further in view of BUIST (US 4,859,250).

The combination of the materials disclosed in FUNAHASHI et al and MATSUBARA et al, connected with the paste disclosed in ALEXANDER, fails to disclose the location of the thermoelectric components in the thermoelectric device.

Regarding claim 17, in conjunction with the previous rejection of claims 13, BUIST teaches in figure 3A the location and connection of p-type and n-type semiconductors. The semiconductors are shown to be attached to a substrate, reference number 24, as described in the column 4 line 14- 45 description of the figure. The thermoelectric element includes the n-type conductor (reference number 64), p-type conductor (reference number 66) and connection between the two (reference number 82). Each element is shown connected in series. The unconnected end of the p-type semiconductor is

electrically connected to the unconnected end of the n-type semiconductor using lead, reference number 80. This is method of connection is conventional to one of ordinary skill in this art. Therefore, the connection of an n-type and p-type semiconductor via an unconnected end would be obvious.

Regarding claim 18, in conjunction with the previous rejections of claims 13 and 17, BUIST utilizes the configuration of thermoelectric elements, as in the rejection of claim 15, shown in figure 3A, and forms the elements into strips affixed to the flexible plastic substrate. In column 5, lines 5-8, BUIST teaches, "the thermoelectric elements are folded to combine all cold strings on a first plane and all hot strips on a second plant opposing the first plane of cold strips". Shown in figure 4, the hot side is compiled on one end of the modulus, while the cold side s complied opposite.

At the time of invention, one of ordinary skill in the art would find it obvious to organize the combination of the materials disclosed in FUNAHASHI et al, MATSUBARA et al and ALEXANDER in the manner of BUIST because the layout of similar temperature elements on opposing sides is obvious. It is intuitive to place the cold strip elements on one side of the thermoelectric modulus and the hot elements on the other because a thermoelectric device is usually used to generate power from a temperature gradient on two different sides of the device. The organization of the elements taught by FUNAHASHI et al,

MATSUBARA et al and ALEXANDER in the pattern of BUIST is obvious as it allows the thermoelectric device to function efficiently.

Response to Arguments

12. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection, based on amendments to the claims.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KOURTNEY R. SALZMAN whose telephone number is (571)270-5117. The examiner can normally be reached on Monday to Thursday 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

krs
8/25/2008